

February 6, 1961

Dr. Arthur C. Koch  
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University of Florida  
College of Medicine  
Department of Biochemistry  
Gainesville, Florida

Dear Doctor Koch:

I have been laboring under the impression that I had long since acknowledged and commented on your manuscript, "Light scattering by object of biological interest." However, as I now find some unfinished notes on this, I am afraid this may have slipped and I must send my apologies and hope that I have not caused you any inconvenience. Please let me know if you would like to have the draft that you sent me back and I will return it promptly.

I would certainly agree as to the importance of a detailed treatment of the theory of light scattering, especially in the difficult region where  $\lambda \approx r$  since so much of our observation of bacteria, both with the microscope and with the nephelometer depends on a clear understanding of their optical properties. The main comment I would make is that you refer on page 7 and elsewhere that bacteriologists have some precise impression of the biophysical basis of optical density and I would consider this rather optimistic both from the standpoint of special theory and bacteriologists' psychology. In fact, it seems to me that we rather badly need some more precise measurements of the wavelength dependence of light scattering and these should be made in a carefully designed instrument. The papers by Koga may come as close to this as any and they still do not cover all the interesting wavelength regions. If you can quote a reasonably satisfactory study of the scattering properties of bacteria in the ultraviolet, I would be very much obliged to you.

The other comment I would make is to re-echo your remarks on page 14-15 on the influence of aperture on turbidity measurements. In practice I wonder whether anyone has made a study of light scattering at angles sufficiently close to the forward beam for the optical density to be quite meaningful, for example in terms of your equation 7. It may be necessary to recalculate all of these functions with respect to the amount of light which is retained within a given increment of angular deviation of the beam.

Mr. Elliot Packer here who has scrutinized your manuscript has indicated the following typographical corrections:

Koch, A.

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Page 4, equation 7

. . . , equation 8

Page 11, table 1 was not included with the manuscript.

Bibliography reference 24, the page should be 566 instead of 560.

. . . . . reference 33, Legendre polynomials is garbled.

Are there no direct measurements on the optical dispersion of nucleic acids as well as proteins?

We have been delayed rather longer than we had expected but I am optimistic now of getting started with some more detailed experimental measurements along these lines on bacteria. Among other things, it seems to me that the parameters are quite essential for the interpretation of micro-spectrograms of single cells which we have had in mind to be studying on other grounds.

I am appending some literature references that might be of some interest to readers of your paper. Thank you very much for having let me see this manuscript and I hope you will let me know where it is to be published.

Yours sincerely,

Joshua Lederberg  
Professor of Genetics

References: Koga, S. and Funjita, T., 1960. Total cross-section for optical scattering by spherical cells in suspension. J. Gen. and Applied Microbiol. 6: 101. Also see references therein.

Bateman, et al., 1959. J. of Colloid Science 14: 308-329.  
Determination of particle size and concentration from spectrophotometric measurements.

Heller and Tabibian. Sources of error in turbidity measurements.  
Several papers in the J. of Colloid Science, 1957 ff.